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ABSTRACT

Offering courses online is a big trend in today's teacher education. This new trend requires students' self development, achievement, and growth. This paper discusses courses that can be offered online and their criteria, and the quality of science courses and the standards they need to meet. (Contains 10 references.) (YDS)

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SCIENCE EDUCATION ONLINE

An innovative trend in teacher education is for students to take courses online. There is considerable merit in emphasizing this approach. The convenience of using the home computer to take classes saves much time indeed instead of driving to a university campus. The hassle of locating a university parking space, when commuting to a class, can be time consuming, especially when university home basketball games are being played. When taking a university class, the author drove 120 miles round trip during the latter 1950s after teaching all day. This was done twice a week to complete master degree requirements. The rest of the masters' degree program was taken in summer and on Saturdays. Time spent in driving to and from taking classes might have been spent better in working online and focusing upon course work. To say the least, time was lost in sleeping. Any teacher and school administrator needs adequate hours of sleep to feel his/her best.

When working online, the university student needs to motivate the self to achieve, grow, and develop. There is no time schedule to follow. No professor is there to call the roll to see if students are attending class. Thus, the student must set up a flexible time schedule to work online. If a person is head of a family, he/she may take care of family responsibilities and then work online. The ambitious student may work harder than others to complete course requirements. A student with much ability might also complete lessons more quickly that those of lesser talents. This all sounds fine so far for most science education students be they undergraduate or graduate students (Education Week, May 9, 2002).

Science Education and Quality

Science courses online should meet definite standards such as

1. having adequate hands on experiences for students to work as scientists do.

2. stressing relevant subject matter which is vital and significant. The subject matter must be useful for university students to use in teaching public school pupils.

3. emphasizing appropriate skills for learners to apply in classroom teaching. These skills emphasize that university students learn about the proper and efficient use of science materials of instruction.

4. developing proper student attitudes toward objectivity,

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interests in science, and toward other learners.

5. wanting to be a life long learner (Ediger and Rao, 2001, Chapter Two).

Perhaps, one notices weaknesses here in teacher education online pertaining to the curriculum area of science. Thus, the university student would need to experience hands on science learning experiences when these are integrated with online lessons and assessed by the writer of online course work. Relevant subject matter, no doubt, can be acquired online; however it will not be integrated with actual field work in science involving an actual classroom. Skills to be acquired by university students in teaching science must involve the actual items and objects used by good teachers. Attitudes are hard to assess in online instruction. Better it would be if the instructor writing course content online could actually observe the university student and his/her attitudes toward the science curriculum. It almost appears as if online course work does not harmonize with the teaching of science unless additions and modifications are made. Certainly, it is possible for online learning and a hands on approach in learning the methods and content of science can be harmonized (Ediger, 2000, Chapter One).

Courses Which Can Be Taken Online

Selected general education classes can be taken online. For example, American History and World History may be taken online. The basal textbooks together with pictured maps, globes, illustrations, and diagrams online can make for a quality course if the activities represent excellence. Both of these courses contain historical subject matter dealing with progress made in science and the scientific method. It is important for the student to secure an appreciation of the increased sophisticated approaches of science as the centuries have unfolded. Perhaps, an entire course on the history and philosophy of the scientific method is available for students online. Scientific literacy needs to be stressed in teaching and learning situations.

Required courses in geography also may be taken online. The geology elements of geography, in particular, become relevant for the science education major. However, in pointing out the science aspects of history and geography classes is not to minimize their entire curriculum. The well educated science educator is also cross disciplinarian and is broadly educated. There are times in developing the science curriculum in the

public schools when integrated science/ social science classes are highly recommended. Too frequently, academic disciplines are isolated from each other and need to be integrated when it is meaningful and good to do so (Ediger, 2002, 602- 605).

Required literature courses can be a valuable tool to use in integrating the science curriculum. What is learned in a university literature course may well transfer to integrating science writings into the public school curriculum for pupils. A fictional story may follow the following model:

1. identification of characterization (characters) in the literary selection.
2. indicating the setting or location place of the story.
3. state or infer the plot of what happened in the story.
4. contain theme or repeating messages contained in the story.
5. possess a point of view of who is telling the story.

There are a plethora of excellent science fiction stories for pupils to read and these writings might well become a part of an ongoing science unit. Science fiction are narrative accounts of something that, perhaps, did occur in real life or they may be highly imaginary. In addition to narrative accounts in literature, expository writing can well be integrated into a purposeful science unit of study. The following are examples of expository writings for pupils:

1. biographies and autobiographies of famous scientists.
2. library books with an accurate description of how rocks are formed, for example. Accompanying audio tapes can assist a slow reader to comprehend more difficult library books as he/she follows along in the text.
3. large, illustrated, picture books for young readers, such as a book on whales.
4. science paper backs on the same title or topic whereby a seminar approach may be used in discussing its contents.
5. supplementary science textbooks which present content on similar topics as contained in the basal used in class. Comparisons may then be made from one source to the next. Reading activities must be related directly to a hands on approach in learning science concepts and generalizations (See Gunning, 2000, Chapter Eight).

Additional courses to take online might well involve written communication. Writing skills cut across all academic areas. It is very important for science educators to write clearly and

accurately since communication of ideas among pupils and the science teacher is salient. Diverse purposes include writing

1. conclusions and summaries of science experimentation.
2. sequential steps inherent in doing an ongoing experiment/ or demonstration.
3. an historical study and written paper on leading early scientists such as Galileo, William Harvey, Capernicus, Johaness Kepler, Charles Darwin, George Washington Carver, Robert Hook, Anton Leuvenhook, Louis Pasteur, Joseph Lister, among others.
4. an outline of salient content as will be given in an oral report to the class.
5. journal writing in conveying that which has been learned in a given lesson in science (Ediger and Rao, 2000, Chapter Five).

Speaking skills will need to be developed in a public speaking class on campus. Goals to achieve here include

1. using words accurately to convey information.
2. speaking with confidence and ease in order to focus on science subject matter being presented.
3. presenting ideas sequentially to listeners.
4. working effectively in oral committee decision making settings.
5. emphasizing diverse purposes in oral communication.

Speaking activities are integrated within the different curriculum areas. It cuts across all academic disciplines. Science education students need to be able to convey scientific information to others in an effective way (See Simpllico, 2002).

Reading courses may be taken online as well as in the university classroom. Much reading is done by university students and science teachers need to be proficient readers as well as be knowledgeable about teaching reading to public school pupils. Thus, the future science teacher needs to assist public school pupils to

1. use phonics and syllabication skills to unlock unknown words.
2. read for meaning and understanding.
3. comprehend subject matter critically and creatively.
4. read to solve problems such as when science experiments are being conducted.
5. read science content for indepth study.

Reading then can be a very important way to learn in the

science curriculum along with a hands on approach. The science teacher must be able to diagnose pupil difficulties in reading so that remediation can take place (Ediger, Marlow, and D. Bhaskara Rao, 2000).

Needless to say, the future science teacher needs to have demanding, well taught courses, among other areas of science, in biology, genetics, chemistry, physics, and geology. These courses must provide teachers with science subject matter to teach well in the public schools. It is of utmost importance that teachers possess adequate subject matter to do a superb job of teaching science. Field experiences and student teaching in the public schools should truly indicate excellence in total performance. Continual plans for inservice education must be in the offing (Blough, and Schwartz, 1984)!

Criteria for Online Courses

There are selected criteria which need to be followed in order to offer effective online courses. Principles of learning from educational psychology need to be followed here.

1. science subject matter and methods need to be relevant and salient.
2. courses in science education must assist the future teacher to be prepared to teach public school pupils well.
3. purpose needs to be involved in choosing content and skills presented for the future science teacher to acquire.
4. interest factors are important in online education.
5. sequence in student learning online needs careful consideration.
6. meaningful learnings need to accrue for the university student.
7. students should become motivated learners.
8. life long learning should be an end objective in online education.
9. the development of professionalism in teaching is vital in science education course work.
10. the student needs to design a quality science curriculum (Ediger, 1995, 1- 2).

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